

NAFLD Disease Burden – Canada, 2019-2030

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BACKGROUND

- There is an urgent need to better understand the current and future magnitude of disease burden associated with NAFLD and NASH in Canada.
 - Obesity is increasing in Canada, affecting over one third of Canadians (1, 2).
 - Nearly 30% of Canadians aged 5-17 years in 2017 were either overweight or obese (3), and may experience progression to advanced disease at an earlier age (4).
 - Canada experiences a high rate of diabetes, with 7.0% of persons aged ≥12 years having diagnosed diabetes in 2016 (5), and over one million undiagnosed diabetes cases (6).
 - The population of Canada is aging and will be prone to increased disease progression to advanced fibrosis in the coming years.
 - There are currently no studies reporting estimates of NAFLD prevalence or disease burden in the general Canadian population.
- In North America, NAFLD and NASH account for increasing numbers of incident cirrhosis, hepatocellular carcinoma (HCC), transplantation and liver-related mortality (7, 8).
- A modeling framework is ideal for providing forecasts that can help in effective resource utilization and the development of strategies to reduce further increases in disease burden.
- Objective:** Use modeling to simulate morbidity and mortality among the Canadian population through 2030.

METHODS

- A Markov model was utilized to estimate the number of NAFLD cases by disease stage (9) as the Canadian population was tracked by age group and gender.
- Progression of disease through fibrosis, decompensated cirrhosis, HCC, liver transplant, and liver-related death was calculated with adjustment for increased background mortality among prevalent F3 and F4 cases (10, 11) (Figure 1).
 - Model fibrosis transition rates varied by sex, age group, and BMI class.
 - NASH cases were estimated based on the modeled distribution of NAFLD cases, with most F0 cases assumed to be simple steatosis, and the likelihood of NASH increasing with fibrosis stage.
- Annual new NAFLD cases were based on long-term changes in adult obesity prevalence (12, 13) as a weighted average using BMI cutoff of ≥25 kg/m² for Census population classified as Asian and BMI ≥30kg/m² for remaining population.
 - Adjusted obesity was estimated at 9.1% in 1975, increasing to 32.7% in 2014.
- There was an assumed starting NAFLD prevalence rate of 25% [uncertainty range: 22.5-27.5%] among individuals ≥20 years of age in 2018 and prevalence among all ages was estimated at 20.4%.

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RESULTS

Figure 1. NAFLD Disease Progression Model

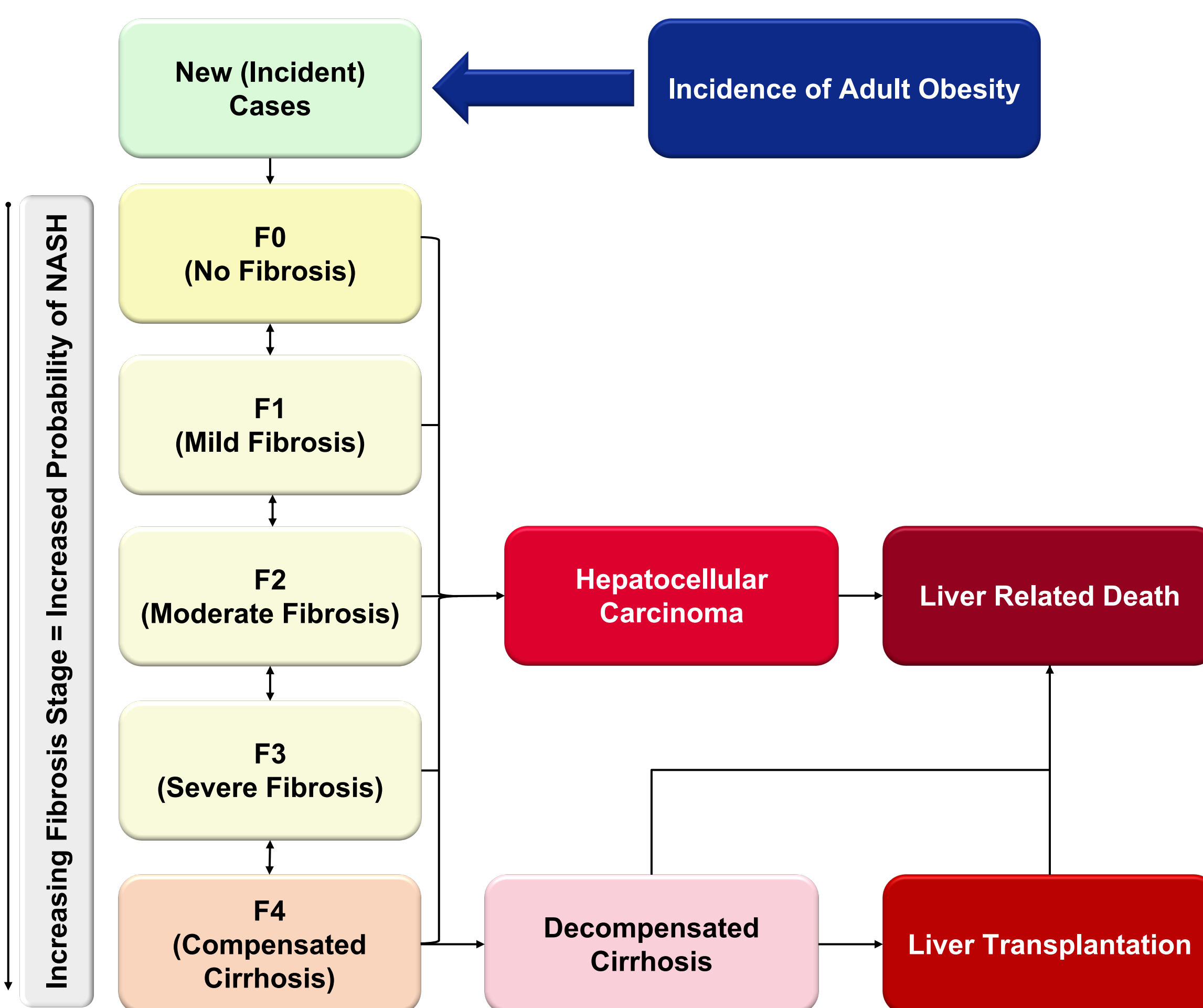
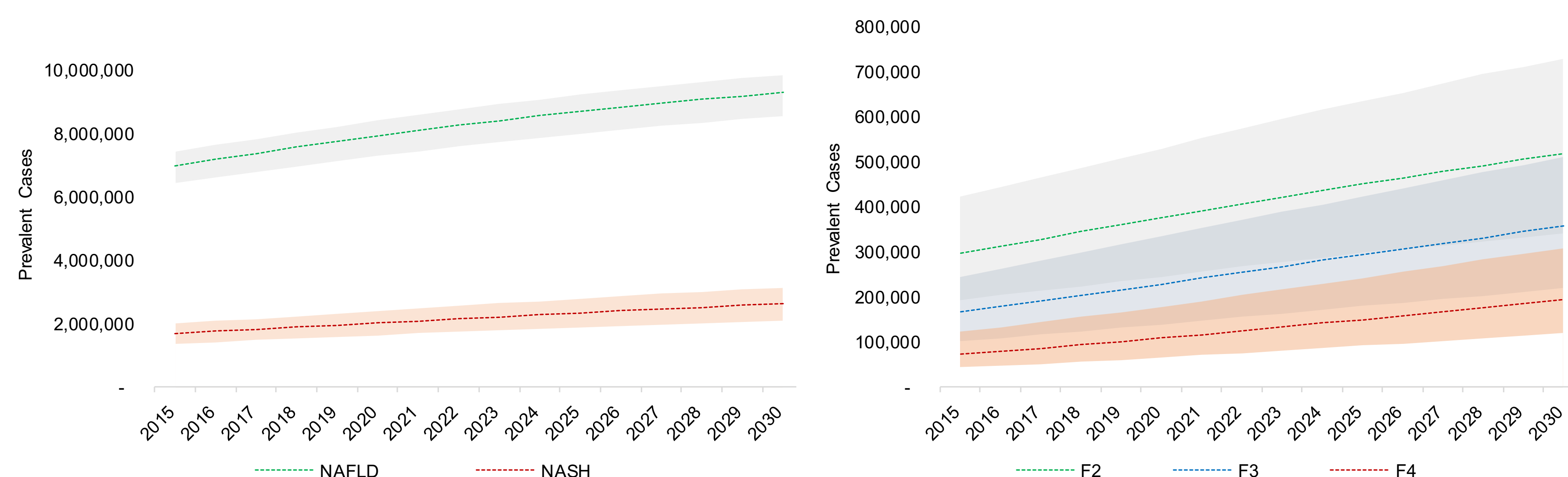
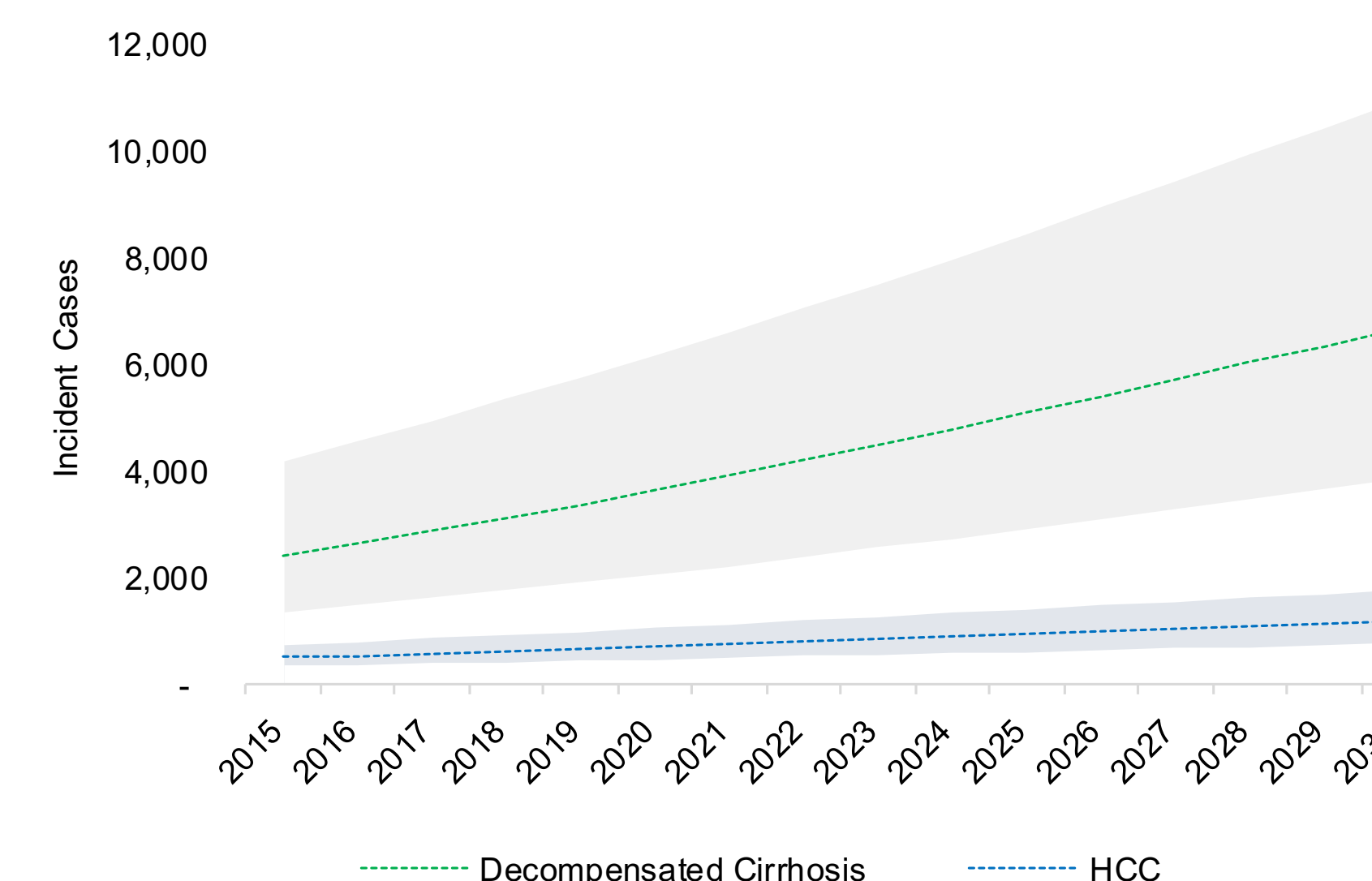


Figure 2. Prevalent Cases with 95% Uncertainty Interval – Canada, 2015-2030



- During 2019 to 2030, NAFLD cases are projected to increase 20% from 7,757,000 (7,138,000-8,232,000) to 9,305,000 (8,550,000-9,875,000) (Figure 2).
 - F3 cases increase 65% from 216,000 (131,000-316,000) to 357,000 (219,000-511,000).
 - Compensated cirrhosis cases increase 95% from 101,000 (60,400-167,000) to 195,000 (120,000-309,000).
 - Prevalent cases classified as HCC, decompensated cirrhosis, and liver transplant increase the most (100%) from 14,000 (8,600-21,700) to 28,200 (17,700-44,700).
 - NAFLD prevalence (all ages) increases from 20.8% (19.1%-22.1%) to 22.9% (21.1%-24.3%).
- Prevalent NASH cases increase 35% from 1,953,000 to 2,630,000 during 2019-2030 (Figure 2).
 - 25.2% of cases were projected to have NASH in 2019, increasing to 28.3% of the projected NAFLD population in 2030.
 - The prevalence of NASH in the general population (all ages) was estimated at 5.2% (4.2%-6.2%) in 2019, increasing to 6.5% (5.2%-7.7%) in 2030.
- Incident decompensated cirrhosis cases increase 85% from 3,400 (1,900-5,800) in 2019 to 6,700 (3,800-10,900) in 2030 (Figure 3).
 - Cumulative incidence of decompensated cirrhosis during the period was estimated at 59,800 cases.
- Incident HCC increases by 70% from 660 (440-990) to 1,200 (770-1,800) cases.
 - Cumulative HCC during 2019-2030 was estimated at 11,000 cases.
- Total mortality among the NAFLD population increases 75% during 2019-2030, from 66,100 deaths to 115,000 deaths.
 - Annual liver related deaths are projected to increase by 100% from 2,700 (1,500-4,500) to 5,600 (3,200-9,000).
 - Cumulative liver deaths during 2019-2030 are projected at 48,700 deaths.
- Among the NASH population, deaths are estimated at 24,400 in 2019, and increase 100% to 49,100 in 2030.
 - Liver deaths in the NASH population are estimated to comprise 10.9% of total deaths in 2019, increasing to 11.3% in 2030.

Figure 3. Incident Cases with 95% Uncertainty Interval – Canada, 2015-2030



CONCLUSIONS

- Modeling demonstrates that NAFLD will represent a growing burden on the Canadian healthcare system over the next decade.
 - Prevalent NASH cases are forecasted to grow 35% while prevalent cirrhosis cases increase by >90%.
 - Annual incidence of NAFLD-related end stage disease and mortality are forecasted to increase by 70-85%.
- Strategies focused on reducing the growth in the populations with obesity, diabetes and metabolic syndrome are needed to mitigate the long-term burden of NAFLD-related liver disease.
 - Identification of risk factors for NAFLD disease progression should be a priority as most NAFLD cases will not develop advanced liver disease (14).
 - Prevention efforts aimed at reducing the incidence of NAFLD as well as slowing fibrosis progression among those already impacted should be top priorities to decrease disease burden.
 - Additional therapeutic and interventional options are required to avert the epidemic of NAFLD-related liver disease.

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